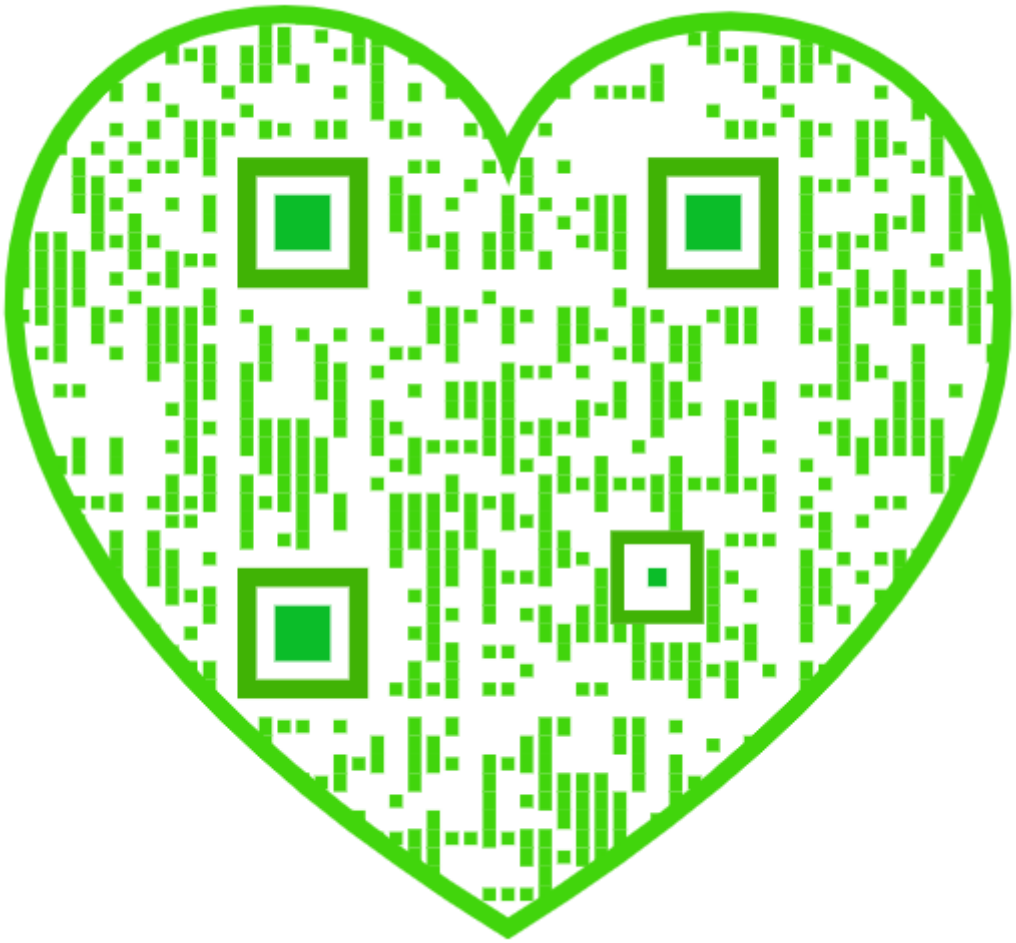
U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1465

COTTON GINNING



THIS bulletin contains a general discussion of those mechanical processes of ginning which are important to farmers. Only saw gins are treated, as only a small part of the cotton crop is ginned by any other method.

The purpose is to bring to the attention of cotton producers, especially in those communities where cooperative handling and marketing of cotton is possible, the numerous benefits to be obtained by keeping the seed pure and by eliminating a portion of the losses caused by indifferent preparation of cotton for the market.

Special attention is called to the careless preparation of the American bale of cotton, the seeming indifference to this matter shown by the farmer, the buyer, and others handling it, and the losses arising from such indifference.

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COTTON GINNING[1]

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SEPARATION OF SEED FOR PLANTING

One of the greatest difficulties in the production of cotton of uniform fiber is the inability of the planter to maintain the purity of the seed of the particular variety he prefers. He makes a practice of buying new seed every two or three years, as the contention is that seed "runs out" in this length of time—that is, his seed becomes so badly mixed, either at the gin or by cross breeding, that it no longer represents the variety originally planted. In the nature of things, different varieties of cotton become mixed if grown in adjacent localities because of the interchange of pollen.

Pure seed for planting purposes may be maintained by a proper system of seed selection,[2] which applies to all varieties of cotton. It is a good plan to pick planting seed from the lint by hand, so that it will not become mixed with seed from cotton of another variety; or, if so much seed is needed that this is impracticable, the cotton may be ginned in the regular way with good results if the ginner first takes the precaution to clean out thoroughly all the gin heads and to let the machinery run a few minutes so that all the seed and seed cotton from preceding bales will be removed. Particular care should be exerted to the end that the seed bin and trough are entirely free of any seed that may have been left from some other variety of cotton. In some gins the seed is not allowed to go into the seed bin, but by means of a board or piece of metal is conducted to the floor of the gin house, which should be swept

[1] This bulletin is based on Farmers' Bulletin 764: Cotton Ginning Information for Farmers, by Fred Taylor, D. C. Griffith, and C. E. Atkinson. 1916.
Thomas H. Kearney, Seed Selection of Egyptian Cotton. U. S. Dept. of Agriculture, Bulletin No. 38. 1913.

[2] O. F. Cook. Cotton Selection on the Farm by the Characters of the Stalks, Leaves, and Bolls. U. S. Dept. of Agri., Bu. Plant Ind. Circ. 66, 1910.

clean before beginning the operation. This is by far the safer method. Some improved gins have a hinged metal chute which may be let down so that the seed discharged from the breasts will fall onto the floor instead of into the seed trough.

If a large amount of selected seed is to be saved, the best results are obtained by ginning either very early in the season or after the rush of the season is over, when the ginner can take greater care in exercising the precautions that will maintain the purity of the seed. It is practically impossible to maintain the purity without the cooperation of the ginner, and it is unreasonable to ask him to delay his regular ginning work and keep other patrons waiting. Many ginners designate a certain day each week or certain days at the end of the season for the ginning of seed for planting. The manufacturers of ginning apparatus, in designing improvements, could well afford to give serious thought to the question of the quick and easy cleaning of the gins and the seed conveyors so as to encourage the use of selected planting seed. One solution of the planting seed problem possibly would be the installation of a small separate ginning unit. Such a gin might be set up in line with the battery of gins with the lint flue in direct connection but without connection with either the distributor or seed conveyor. During the regular ginning it could be thrown into gear and fed by hand with the seed cotton from which planting seed was desired, and the seed could be caught either in a box below or through a special chute directly into bags.

This care is necessary for the following reasons:[3] In the usual process of ginning, the seed roll, containing about 30 to 35 pounds of seed, is originally made from the seed of the first bale ginned. This seed roll fills the gin head, but the seed in it changes constantly and gradually. Thus each customer, after the first, receives the right quantity of seed, when he catches it in the seed bin; but the quantity is not made up entirely of the seed from his own cotton, some of that being left in the seed roll, to make up for that which he receives from the roll as originally formed. For any purpose other than for planting this is no detriment, but it is readily seen that seed obtained in this way may be composed of several varieties.

A most effective method of obviating this very serious defect in present methods can be used to advantage if each community will determine by experiment[4] the particular variety of cotton which is best suited to its section and agree to plant this variety only.

GINNER'S CERTIFICATE FOR THE FARMER

By driving a wagonload of seed or unginned cotton upon the scales, the gross weight may be determined. When the cotton has been ginned, the empty wagon is weighed. This second weight represents the tare, which is subtracted from the gross weight; the

[3] D. A. Saunders and P. V. Cardon. Custom Ginning as a Factor in Cottonseed Deterioration. U. S. Dept. of Agr., Bull. No. 288, 1915.
W. W. Ballard and C. B. Doyle. Cottonseed Mixing Increased by Modern Gin Equipment. U. S. Dept. Agr. Circ. 205, 1922.

[4] "Distribution of Cotton Seed in 1915." U. S. Dept. Agr., Bu. Plant Industry, Doc. No. 1163.
O. F. Cook. Cotton Improvement on a Community Basis. Yearbook, Dept. Agri., 1911.

remainder represents the weight of the seed cotton with its impurities of dirt and trash:

	Pounds
Gross (weight of loaded wagon)	3,020
Tare (weight of empty wagon)	1,600
Net (weight of seed cotton)	1,420

Thus the customer can compare the ginner's weight of seed cotton with his original weight—that is, if he has weighed the cotton into his wagon. He can also calculate how the weight of his bale of cotton compares with the weight based on his estimate of the correct percentage of resulting lint. This percentage varies in different sections, as well as in different varieties of cotton, for the percentage of lint is merely the relation between the mass of the fiber and the mass of the seed. The size and weight of the seed and the quantity of fiber on the seed varies considerably in different varieties. Generally speaking it might be said that the smaller the seed the higher the percentage of lint, but it is also true that the smaller the seed the greater the number of bolls required to produce a bale of cotton. Some of the improved big-boll varieties run as high as 36 to 40 per cent of lint. On the other hand, small-boll varieties vary all the way from 25 to 45 per cent of lint, but the higher the lint percentage of the small-boll varieties the shorter and more abundant are the fibers on the seeds.[5]

A copy of a recommended weight certificate is here given. It gives all details from the time the wagon is first weighed until cotton and seed are ready for the market:

Driver_____ Date_____

On. Off.

JOHN DOE, Ginner

Owner _____

	Seed cotton
Seed disposition_____	Gross_____
Weight of seed_____	Tare (wagon)_____
Bale mark and No_____	Net_____
Bale weight_____	Weigher_____

Name of driver should be written on line marked "Driver."

The words "On" and "Off" are used to show whether the driver was on or off his wagon when the load was weighed. If on, the word "Off" should be crossed out; if off, the word "On" should be crossed out. A weigher can not be expected to remember whether the driver was on or off the wagon when the load was weighed, and it is necessary to weigh the wagon the same way the second time in order to have the correct weight of seed cotton.

If seed is hauled from the gin by the customer the word "Out" should be written in the "Seed disposition" line. If seed is stored with ginner, "In" or "Stored" should be used. If sold to ginner, this space should be marked "Sold," followed by number of his check given in payment.

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[5] O. F. Cook. Danger in Judging Cotton Varieties by Lint Percentages. U. S. Dept. Agr., Bu. Plant Industry Circ. 11. 1908.
G. S. Meloy. Lint Percentage and Lint Index of Cotton and Methods of Determination. U. S. Dept. Agr. Bull. 644. 1918.

The line marked "Gross" shows the weight of the wagon and load. The line marked "Tare" shows the weight of the wagon after unloading the seed cotton. Subtracting the tare from the gross, the net weight of seed cotton is given, which should be inserted on the line marked "Net."

All other lines should be filled in as indicated.

The original of this certificate is made with perforated edge that it may be torn out and given to the customer. A duplicate certificate of a different color should be left in the book. Carbon sheets should be used in order that an exact copy may be kept by the ginner for his records, as an error is likely to occur if the duplicate is made in some other way. The use of carbon sheets will save labor and possible misunderstandings.

If the customer returns for the seed or sells it after it has been left in storage, the ginner should make proper notation on the original and duplicate certificates.

USUAL GINNING PROCESS

In the usual ginning process the seed cotton is fed into chutes by the elevator system, which takes the cotton out of the wagon by means of a suction fan. The cotton drops through the chute into the feeder and is then fed evenly to the gin saws, where the lint is separated from the seed.

The seed slides down to a trough from which, by a screw conveyor, it is carried to the seed pipe, thence to the seed bin or seed house. The transfer through the seed pipe to bin or seed house is effected either by a revolving screw conveyor or by the exhaust from the fan which furnishes the suction for unloading the cotton. When the screw conveyor is used, in the more up-to-date plants, the bottom of the seed trough is made of perforated metal which permits sand and dirt to be sifted out, thus improving the quality of the seed. If the customer wishes to retain his seed, he asks to have it conveyed into the seed bin, from which he takes it after his bale is ginned. When he wishes to sell or store it, it is conveyed into the seed house. The seed bin is situated in the gin yard between the ginhouse and the seed house, as with this arrangement the seed may be stopped at the seed bin or conveyed to the seed house by the use of valves in the seed pipe. When the seed is sold to the ginner or stored with him, it is not usually weighed, but a certain number of pounds are allowed. This amount usually ranges from 60 to 66 pounds per 100 pounds of seed cotton, the allowance being based on the average quantity of seed to 100 pounds of seed cotton in a given locality. The system of average percentages is, at best, inaccurate and unsatisfactory. An automatic weighing device is manufactured which can be set to weigh any small quantity of seed, the weight of a bushel being the usual amount. An automatic trip lets the seed into the seed pipe and registers the quantity on an indicator, which makes it possible for the ginner to pay each customer for his exact weight of seed. The trips of this indicator are carried forward automatically to another indicator which keeps the total number of trips through the season, and in this way affords the ginner an easy method of knowing the quantity of seed he has on hand. The first indicator is reset for each bale.

The lint cotton is passed from the gin saws through the lint flue to the condenser, which gives it a final cleaning and smooths it out into a bat or sheet. The lint is then dropped into the press box,[6] where it is pressed, wrapped, and tied, the size of the bale being usually 27 by 54 by 45 inches.[7] The bale is weighed, a certificate is given to each customer, and the bale is then ready for market.

ONE AND TWO STORY GINS

Most gins are of one or two stories. Each plan has some advantages. Without doubt a gin can be operated on the ground floor with less vibration, and therefore with less wear, tear, and friction, but with proper care and material a two-story gin can be built that

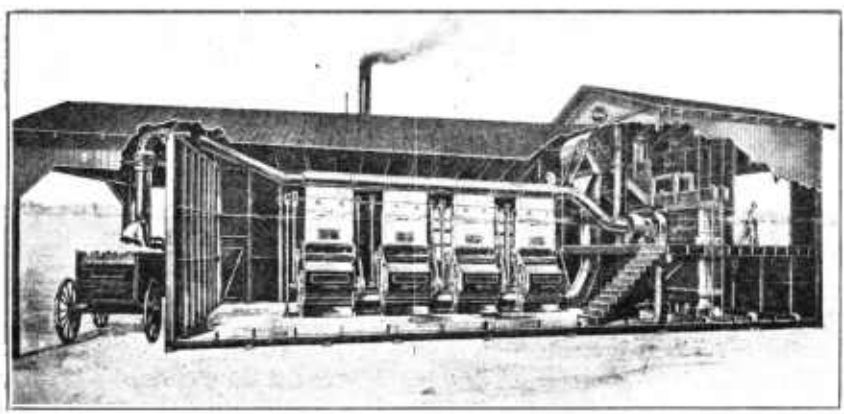


FIG. 1.—One-story gin, showing battery of four gin stands on the ground floor

will not vibrate to a great extent. Low fire risk, and therefore cheaper insurance, is one of the chief advantages of one-story gins with an earth or concrete floor. (Figs. 1 and 2.)

PRINCIPAL PARTS OF GIN MACHINERY

ELEVATORS

Two distinct types of elevators are used on modern gins, the pneumatic elevator and the belt-distributor elevator.

The pneumatic elevator consists of two wooden or metallic pipes passing over a single gin or battery of gins (fig. 3). One is the air pipe, the other the cotton pipe. These pipes open at the bottom into chutes over the feeders. The cotton passage is separated from the air passage by a heavy wire screen. The suction in the air pipe causes the seed cotton to pass along the cotton pipe and drop into the chutes. When the chutes above the feeder become full, the cotton ceases to pass through the cotton pipe until a portion of the seed cotton is ginned out. When the air pressure is removed at regular

[6] A double press box is the one in most general use. When a bale is ginned into it the press box is revolved through an arc of 180° to be pressed.

[7] Twenty-seven by 54 inches is the standard size of the press box. The depth depends upon the density to which the bale is pressed, 45 inches being the usual dimension.

intervals, the cotton is dropped to the feeders, then to the gin saws. The method of removing the air pressure varies with different makes of elevators (fig. 3).

FIG. 2.—Two-story gin, with battery of four gin stands on second floor

The belt-distributor elevator consists of what is called a separator placed over a belt box through which passes a belt with projections or fingers placed thereon (fig. 4). A suction fan connected with the separator draws the cotton from the wagon into the separator, where it is thrown against a heavy wire screen, after which it is carried to the feeders by the belt distributor. When the feeders are filled, the surplus cotton is carried by the belt distributor to the end

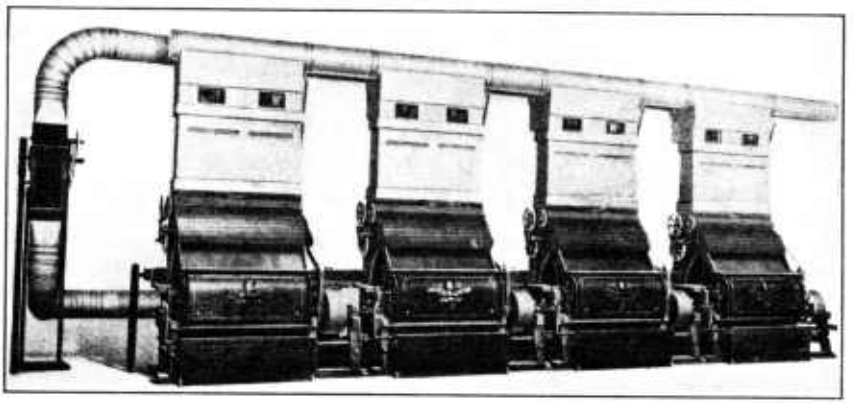


FIG. 3.—Pneumatic elevator over a battery of four gin stands

of the belt box and dropped onto the floor. This surplus cotton is called the "overflow."

A large portion of the cotton going through the belt-distributor elevator goes to the overflow. When the cotton on the wagon is

exhausted the suction is switched and the cotton from the overflow again passes through the separator and belt distributor. In this way it receives a double beating and cleaning before it goes to the feeder. It is a noticeable fact that the portion of the cotton which goes to the overflow and is again passed through the cleaning system is always of a better grade than that which passes through the machinery only once. When ginning his own cotton, a ginner frequently passes the entire load through the overflow and then rehandles the seed cotton before ginning. There is no doubt that it is profitable to do this, especially if the cotton is damp, as the quality is thereby improved.

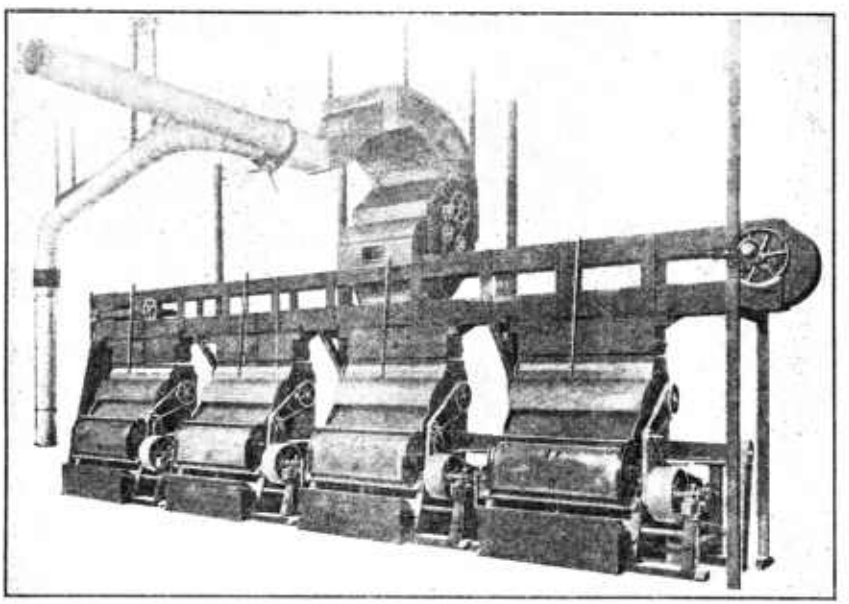


FIG. 4.—Belt-distributor elevator over a battery of four gin stands

PREPARATORY CLEANING PROCESSES

There are a number of bolly machines, boll extractors, boll breakers, beaters, cleaners, etc., which have for their object the separating of boll hulls, trash, and other foreign matter from the seed cotton before it reaches the gin saws. Some of these machines are separate devices through which the seed cotton is passed before reaching the feeders, others are built as a part of a cleaner feeder, and still others are combined with the separator. Frequently one gin plant makes use of several of these devices, passing the seed cotton through each in turn. Figures 5, 6, 7, 8, and 8A illustrate a number of the different kinds of machines.

These devices greatly improve the preparation of both cotton and cottonseed for the market. The removed boll hulls may be used for fuel, thus sometimes effecting a considerable saving.

CLEANER FEEDERS

Cleaner feeders are sold by every firm that manufactures cotton gins, the different makes being practically the same in mechanical principle. Cleaner feeders should be used by all ginners in prefer-

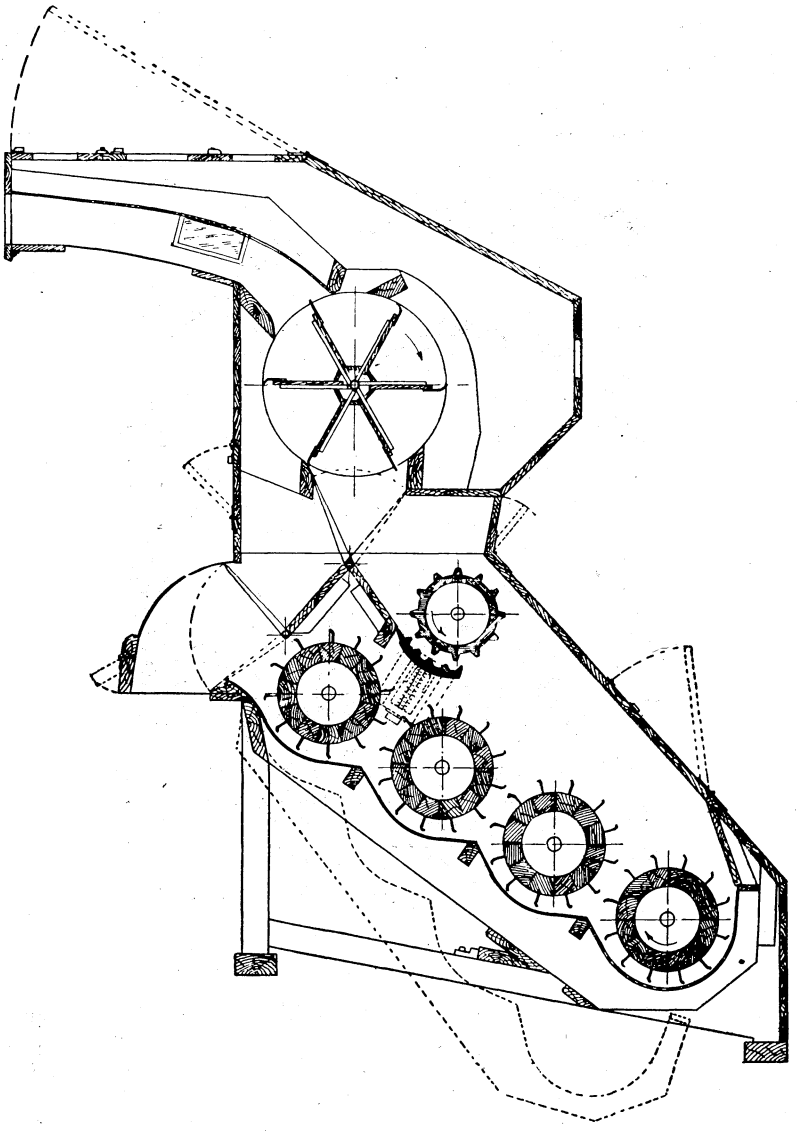


FIG. 5.—Separator, boll breaker, and cleaner

ence to plain feeders without cleaner attachment, as by their use the quality of the cotton is improved materially. In the cleaner feeder the cotton passes through fluted rollers and over a rapidly revolving picker roller which is studded with spikes, thus beating the cotton vigorously and dragging it across a heavy wire screen. The greater

portion of the dirt and dust drops through this screen and is carried out by a screw conveyor. Figures 9 and 10 show working parts of two styles of cleaner feeders, and Figure 11 a cross section of another style.

GIN SAWS AND RIBS

The designs of the ribs of gins are different for plain, single-rib huller and double-rib huller breasts. Huller breasts have been used more commonly in those sections in which cotton is "gathered" rather than "picked." When cotton is "gathered," bolls, leaves, and trash are mixed with the seed cotton. A huller breast is required

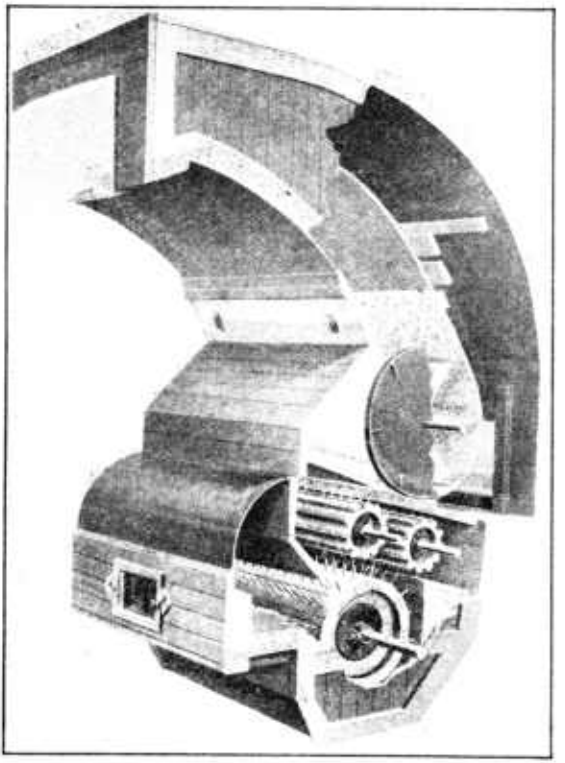


FIG. 6.—Combined cleaner and separator

to eliminate these, which otherwise would be broken up and remain in the lint. Even in those sections where cotton is picked clean, the opinion is becoming prevalent that a huller breast is a good investment, since years in which the rotting of the bolls causes cotton of lower quality than usual come at uncertain intervals to every section.

COMPARISON OF 10 AND 12 INCH SAWS

Gin saws are made in two sizes, 10 and 12 inches in diameter. Saws 12 inches in diameter came into more general use with the development of the double-breasted huller gin. They have been

found more efficient generally than the 10-inch saws because of their greater wearing surface. They have therefore largely supplanted the smaller size.

In ginning, the points of the saw teeth penetrate the mass of fibers. Some fibers are caught on the teeth and pulled off the seed. The fibers usually break off close to the seed coat. The fuzz which is left on Upland seed after ginning is not the ends of the long fibers, but is composed of a different type of fiber which is naturally short and resembles immature cotton. For good results each tooth should engage only a few fibers, and these should be removed from the teeth before they again come in contact with the unginned cotton. If the seed is damp or the roll too tight or hard, each tooth will take

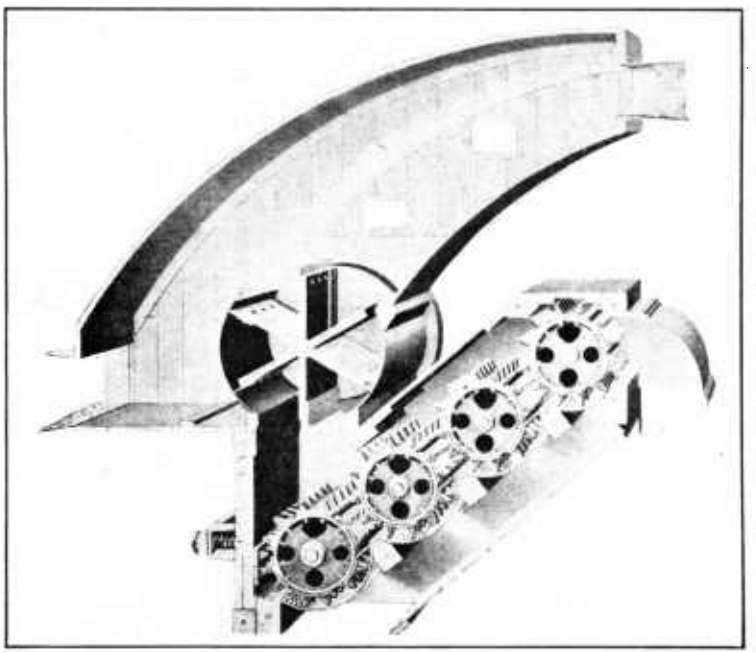
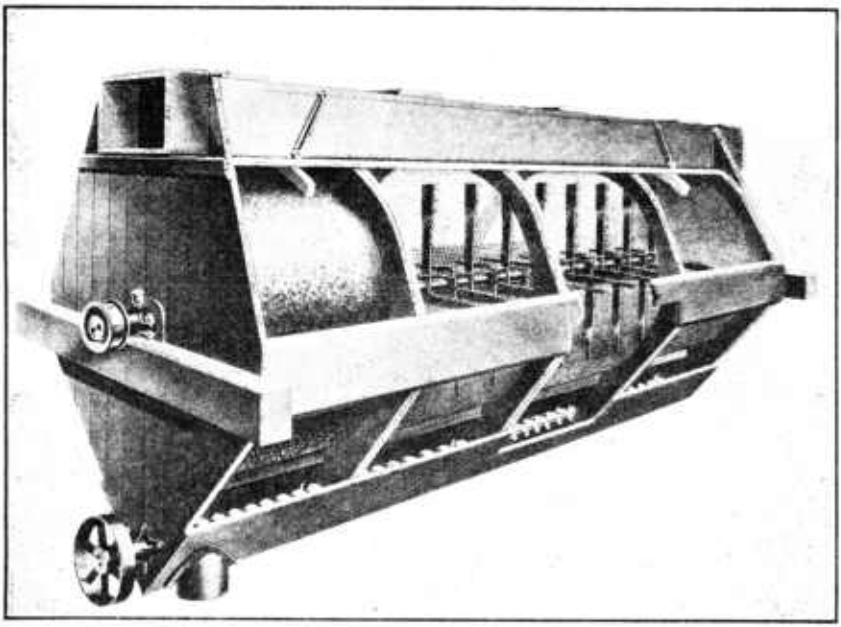
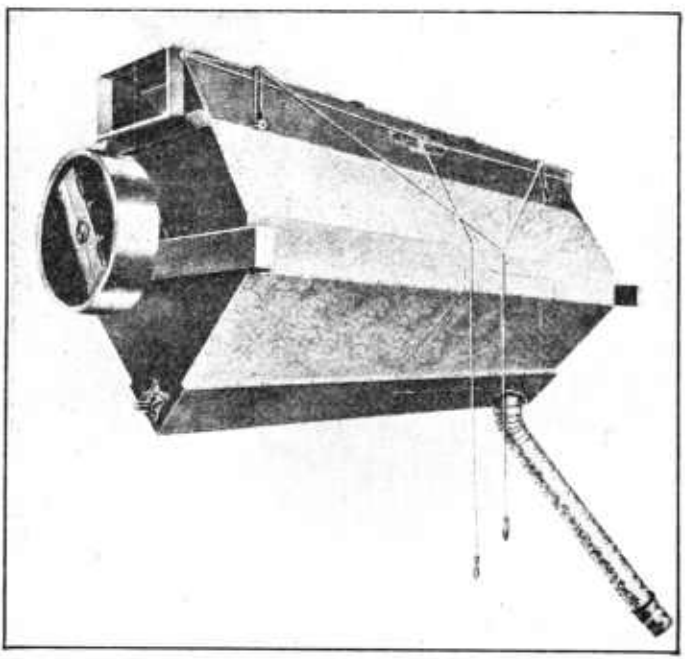


FIG. 7.—Combined cleaner and separator

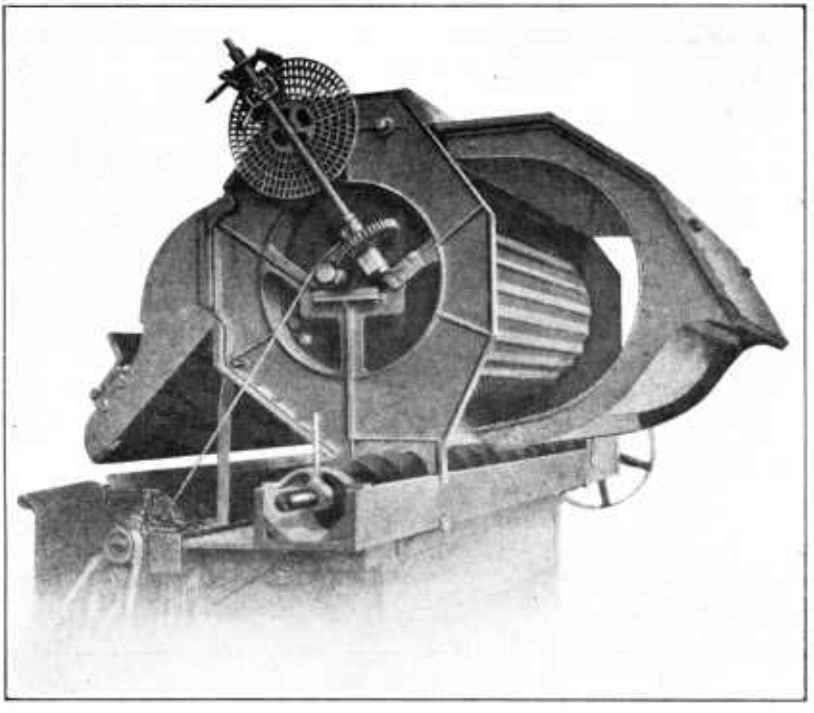
off too many fibers at a time. These may be so many as to be cut when drawn between the ribs, or, if wet, may stick to the saws and be returned through the roll several times, each time taking on more fibers until the lump is cut in passing between the ribs.

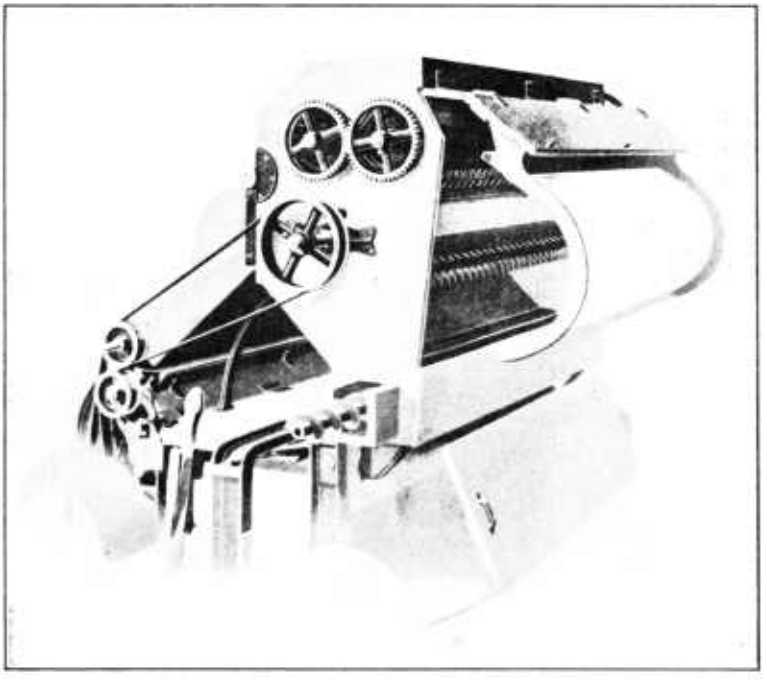
Dull teeth do not penetrate between the fibers readily and are therefore likely to break them. Broken and bent teeth seriously damage the cotton. Gin saws should therefore be kept sharp and true. In sharpening, care should be taken to see that the original shape or pitch of the teeth is preserved, otherwise instead of sticking into the cotton between the fibers as originally designed their shape may be so changed as to cut the fibers seriously. The edges of the teeth should be smooth. Sharpening usually leaves the edges rough. Unless this roughness is dressed down it is likely to damage the





FIGS. 8 and 8A.—Two views showing a separate cleaner





FIGS. 9 and 10.—Views showing working parts of two styles of cleaner feeder

cotton. Newly sharpened teeth will become smooth after two or three bales have been ginned.

For convenience and saving of time an extra saw cylinder is a good investment. These are interchangeable and should be kept sharp and in good condition at all times so they may be substituted as soon as needed.

Sand, dirt, stones, and other foreign matter in the seed cotton dull and damage the saws and cause excessive wear in other parts of the

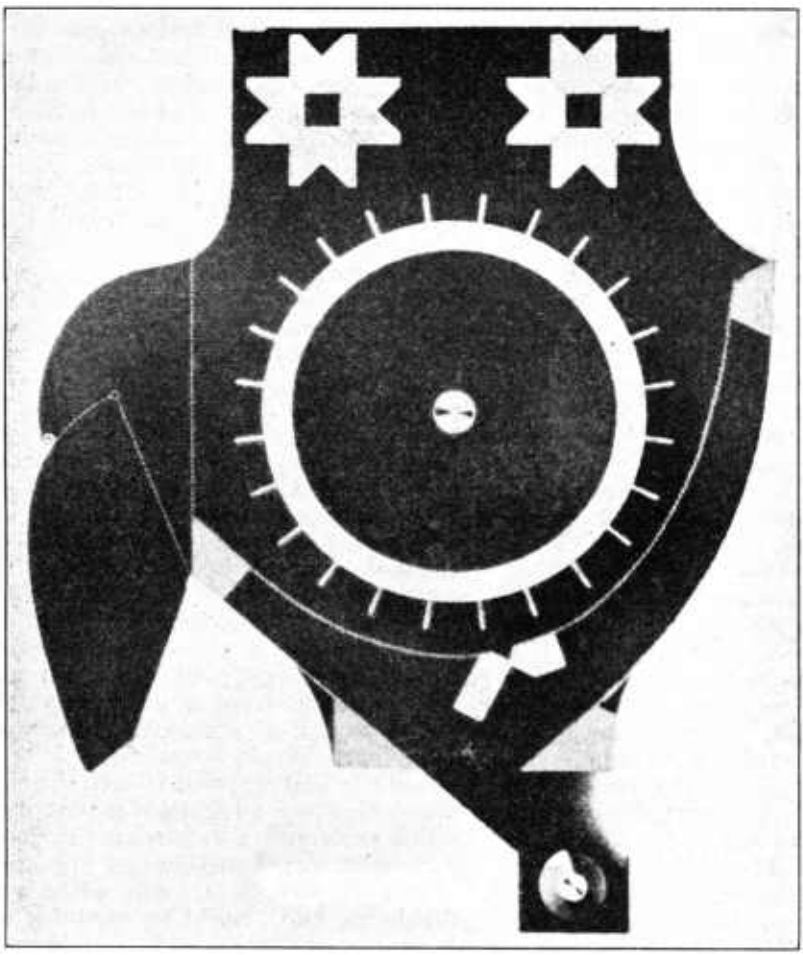


Fig. 11.—Sectional view of a cleaner feeder

gin machinery. Cleaning devices, therefore, not only improve the grade of the cotton but prolong the life and reduce the upkeep of the gin outfit itself.

SPEED OF GIN SAWS

Saws 12 inches in diameter have about 20 per cent more edge and teeth than saws 10 inches in diameter; therefore, at the same number of revolutions per minute, the teeth on 12-inch saws are moving far-

ther and faster than the teeth on 10-inch saws. By "saw speed" is meant the speed of the teeth through the seed roll. This speed is limited by several conditions.

(1) The fibers must be removed from the teeth by the brush before the teeth come back into the roll. To do this, it has been found that the brush cylinder must revolve about three times as fast as the saws. Mechanically the speed of the brush is limited.

(2) The speed of the saws is limited by that rate at which the teeth become cutting rather than penetrating and pulling instruments. A disk of writing paper may be revolved fast enough to cut wood. Gin saws if given too great a speed will not only cut the fibers but will also cut seed that may come in contact with the edge of a saw. When seed are cut or damaged portions of the seed coat, often unginned or with much of the fiber still attached, pass between the ribs and into the lint and reduce the value of the cotton. Excessive saw speed also has a tendency to cut off some of the fuzz, which finds its way into the cotton, increasing the waste and reducing its value for spinning purposes.

(3) The length of the fibers also seems to limit the saw speed. The longer the fibers the slower the saws should be run and the softer the roll should be maintained. Probably the longer fibers are more tangled than the shorter fibers, so that a quick jerk will break them before they can slip out of the tangle.

For ginning cottons up to and including $1\frac{1}{16}$ inches in length of staple, under average conditions, a speed of about 400 revolutions per minute for 10-inch saws and 320 for 12-inch saws is recommended. The capacities of gins equipped with saws of these two diameters are approximately equal at these speeds. Often gins are "speeded up" in an effort to gain time, but the unfortunate result of speeding is to cut the fiber of the cotton to an extent which costs the producers a great amount of money each year.

Although the undue speeding of gins is discouraged, because of the injury to the fiber, it is realized that a large amount of education will be necessary to overcome the practice. Speeding of gin machinery is not a good economic principle from a ginner's standpoint. When a piece of machinery is run at a greater speed than was intended by the manufacturer, parts break, boxes run hot, belts slip, and any number of other accidents may happen which, through delays for repairs, will more than offset any advantage gained by a greater speed. The use of 12-inch saws and a reduction in speeds should result in a general improvement in the mechanical operation of the whole ginning plant. These suggestions are offered because it is realized that every reasonable method should be used for increasing capacities without damaging the fiber and that greater speeds are permissible under extraordinary conditions, such as might exist following a long, dry summer or open autumn.

AIR-BLAST AND BRUSH GINS

The lint is removed from the saws by two methods, the air-blast and the brush. The air blast is a comparatively new departure in gin manufacturing. The essential difference between the two types of gins is in the method of taking the cotton lint from the teeth of

the saws. It has been claimed by some operators of the air-blast system that, in effect, the same principle is used by both methods, the mechanical construction being entirely different. In the air-blast method a fan is used to force a steady stream of air through an opening above the saw teeth, directly past the teeth into the lint flues, the stream of air having the same general effect as a brush. (See fig. 12.) The brush operates at a surface speed of about three times that of the saw tooth. Some contend that the speed of the brush bends the bristles back so that they just miss the gin saws; others maintain that the bristles touch the saws and exert both an air pressure and an actual contact which takes the cotton away (fig. 13).

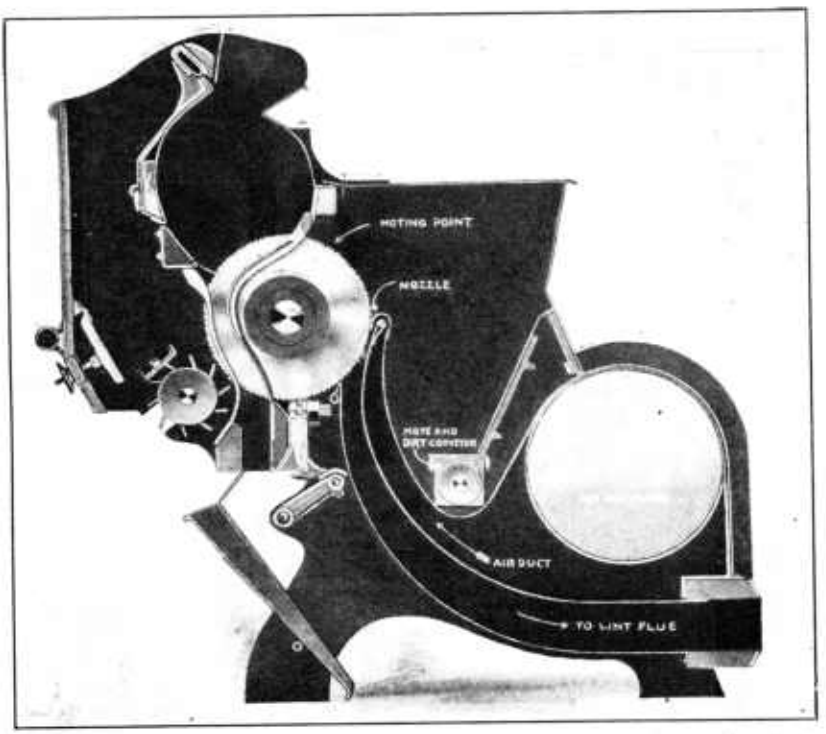


FIG. 12.—Double rib huller gin showing air-blast method of removing lint from saws

The force of the air blast is, of course, almost unlimited, so that the fibers can be removed from the saw teeth possibly more quickly than by the brush method. The quicker removal of the fibers from the saw teeth by the air blast probably will permit an increase in the saw speed, but this can be overdone by increasing the speed as indicated above to the point where the teeth become cutting rather than penetrating and pulling instruments. Manufacturers of air-blast systems of ginning are not yet a unit on the proper speed of the saws. Some makers claim 500 revolutions per minute as the maximum speed consistent with safety. Other makers insist that 750 revolutions per minute and even higher can be used without damage

to the cotton. In all cases the proper saw speed will have to be determined by experiment and practical experience.

Possibly one of the chief mechanical advantages of the air-blast system is that it permits a construction which provides for better moting, a large section of the saws behind the ribs being exposed. This affords a maximum opportunity for motes and other heavy foreign matter to be thrown out by centrifugal force.

After the cotton fiber leaves the gin stand it passes through the lint flue to the condenser from which it passes to the press box. The cotton is pressed down from time to time during the ginning of a bale, either by hand or by a steam tramper. Frequently the

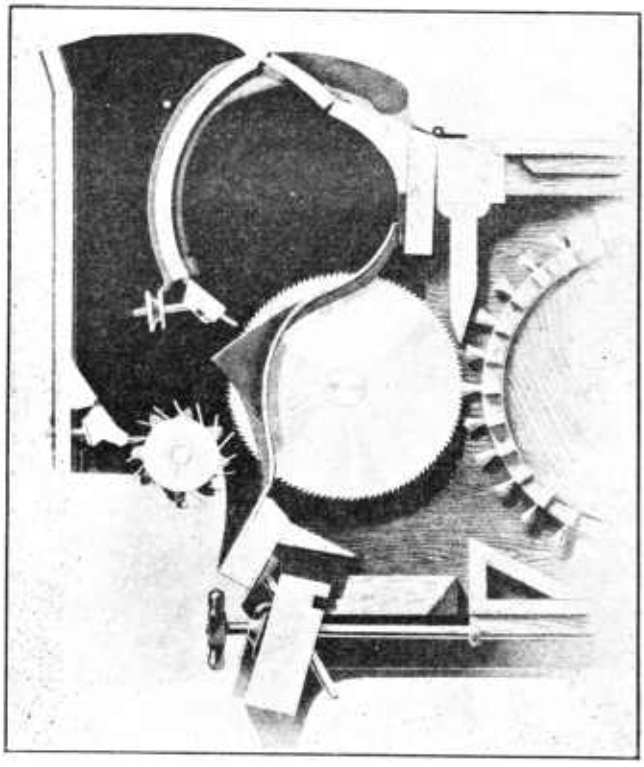


FIG. 13.—Single rib huller gin showing brush method of removing lint cotton from gin saws. Note brush placed in contact with gin saw

packing around the piston becomes loose, allowing the condensed steam to drip on the cotton. This condition causes water-packed bales and results in an enormous annual loss. Such damage can be avoided by the use of mechanical trampers not requiring the use of steam (fig. 14).

PRESSES

There are three methods of baling cotton—the screw press, the steam press, and the hydraulic press. The screw press is the one most frequently used, as it does the work well and is cheaper to install than either of the other two. It is very slow but is fast

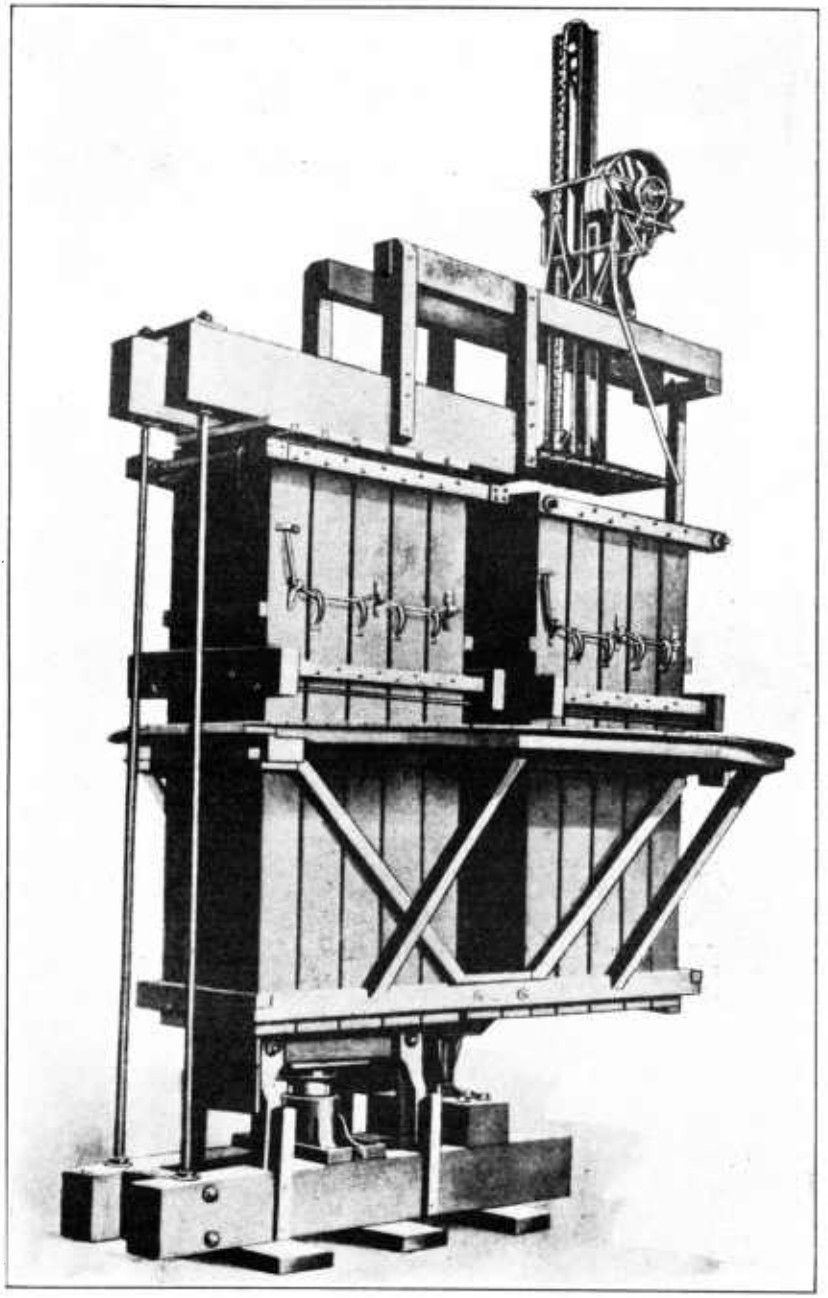


FIG. 14.—Double box press with belt-driven tramper

enough to take care of the cotton turned out by as many as five gins in one battery, as it is possible to "press and tie" a bale when the screw press is used as quickly as the following bale is ginned. However, it would seem that a quicker method would be profitable by saving a considerable part of one attendant's time. The steam press is very quick, and if it were not for the enormous quantity of steam consumed and consequent extra cost, it would be an ideal press. It is the most expensive kind to operate and requires a larger initial investment. The hydraulic press is the most powerful of all. It requires a hydraulic pump to operate, but the consumption of power is not great and a burden is removed from the engine, as compared with the screw press. Although not so quick as the steam press, it is desirable from other points of view.

TARE AND TYPE OF BALES

As the lint or fiber (or raw cotton) comes from the gin, it is put into packages of different sizes and shapes. The bulk of American cotton is packed into press boxes 54 inches long and 27 inches wide, to a depth of about 45 inches. This makes the usual "flat" or so-called "square" bale weighing about 500 pounds. This bale is sometimes called "a gin bale," "a plantation bale," "a farmer's bale," "a soft bale," or "an uncompressed bale." It is usually covered with 3 yards on the top and 3 yards on the bottom, of 2-pound jute bagging (wide mesh), making 12 pounds of bagging per bale, and is then tied with 6 ties, each weighing 1½ pounds, making a total tare of 21 pounds per bale. This is the standard tare that should be aimed at on all flat bales. If more bagging and ties are used in a community than trade rules permit, buyers calculate the excess tare in their price, and so sellers are not benefited as they may think they are. Excess tare is an economic waste, as it is unnecessary and its cost is borne by the bale itself, resulting in a loss to the farmer.

With the exception of the round or rather cylindrical bale and the recently devised gin-compressed square bale, described later on, the American ordinary square bale is of comparatively low density and is not only unwieldy but does not fit economically into either freight cars or the holds of ships. In order that the maximum number of pounds of cotton may be packed for shipment, flat bales are subjected to recompression by which the cotton is compressed to a higher density and the bale reduced to about half the first dimensions. Plants for recompressing the bales are usually located at all important markets and concentration points and are known as "compresses."

The average 500-pound bale as it comes from the gin has a density of only 12 to 15 pounds per cubic foot, and from 30 to 35 bales fill a 36-foot box car. When they are compressed to what is known as standard density compression, which means a density of 22½ pounds per cubic foot, then 65 to 75 bales may be loaded into a car; when pressed to what is known as high density compression, considered to be 32 to 34 pounds to the cubic foot, approximately 100 bales may be loaded into a 36-foot car.

Owing to the enormous quantity of cotton which it is necessary to handle in a short period of time at the large compresses, the bales

are compressed very rapidly. The natural result is that some of the bands are tied shorter than others, and when the pressure is relieved, the bale expands slightly, exerting undue pressure on the shorter ties, often breaking either the ties or the buckles. Sometimes the ties are improperly fastened and fall off. It is not uncommon to see a compressed bale arrive at its destination with two or sometimes three ties missing, as is shown in Fig. 24.

Steamship companies penalize bales $1 each, that are ginned in press boxes of larger dimensions than 27 by 54 inches. Bales compressed to standard density naturally are a little wider and longer, as they expand during compression, the usual measurements for width and length being 30 inches and 57 to 59 inches, respectively, but as long as they come from gin boxes of the 27 by 54 inches dimensions, no penalties are assessed.

The average weight of the American bale is about 500 pounds, but the individual bales weigh anywhere from 300 to 700 or 800 pounds, more or less. Ginners should try to make bales as nearly 500 pounds as possible, as practically all cotton contracts are based on this weight per bale. Bales of much lighter weights cause buyers to penalize them for overtare, which again is an economic loss.

GIN COMPRESSES

In the western part of the Cotton Belt there are a number of gin compresses that make bales cylindrical in shape, but known as "round" bales. These are approximately 35 or 36 inches long and 20 to 22 inches in diameter, are completely covered with a closely woven bagging, known as burlap, and weigh from 250 to 270 pounds each. The bagging or tare is about 2½ to 3 pounds, or about 1 per cent of the gross weight, and covers the bale completely. No ties are used, as the cover is sewed on and this holds the bale without the use of ties. The density of round bales is usually about 29 to 32 pounds to the cubic foot.

There are also what are known as square, or rather rectangular, gin-compressed bales that are compressed to high density at the gin. These are particularly neat packages, one type of which measures 25 inches wide, 52 inches long, and 20 inches thick. The average tare on gin-compressed bales is 4 yards of 1-pound bagging and 7 ties. The tare on such bales varies with the type of the gin, but it is so much lighter than the tare on the ordinary square bale that the buyer can pay a correspondingly higher price. The savings are due to the difference in tare on gin-compressed bales, as compared with the tare on ordinary square bales, and to the fact that gin-compressed bales do not have to be recompressed.

The mechanical construction of a gin compress is in principle merely a very heavy reproduction of the ordinary hydraulic press. This form of compress is capable of producing a density equal to that of a railroad compress, so that shipments may be made direct to the domestic mills or for export.

Cotton that is compressed at the gin requires less material for covering, and the bale is wrapped completely, thus preventing some waste which occurs from a flat bale. It is also more fully protected from the ravages of weather and fire. Bales compressed at the gin

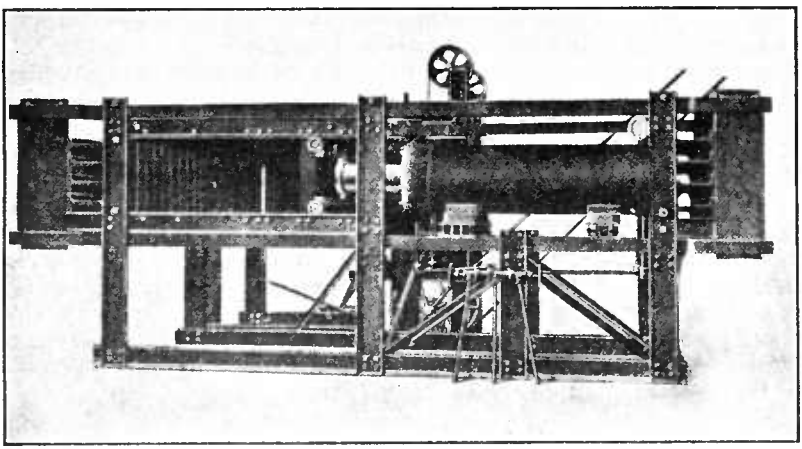


FIG. 15.—A type of gin compress

arrive at their destination in better condition than do other compressed bales, as more care is taken in wrapping and tying them.

A study of the advantages of gin compression is well worth the time expended by any group of farmers who have for their object

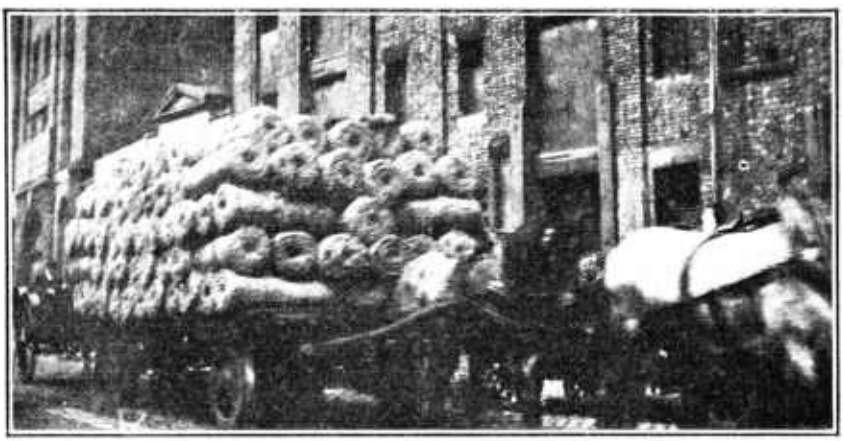


FIG. 16.—Rewoven bagging manufactured from the second-hand bagging taken from American cotton. This lot is in transit from warehouse in Manchester, England, to steamer, for shipment to Southern States, to be used again in wrapping American cotton. Use of this inferior bagging causes much waste that could be avoided by the use of better and more suitable covering

the cooperative handling and marketing of cotton. Figure 15 shows one type of gin compress. Figure 22 shows gin-compressed bales, and attention is directed to the neat and uniform package as compared with the common flat and compressed bale shown in Figure 21.

PLATED BALES

One of the most costly results of overcrowded gins is the "plated" bale. The ginner, in his anxiety to crowd the capacity of his gin, frequently does not allow a sufficient length of time for each wagonload of seed cotton to be ginned completely. He does not raise the breasts, and scarcely stops the feed long enough to judge accurately where one bale ends and a new bale begins. His estimate, ordinarily, is sufficiently correct, as far as the actual quantity of cotton is concerned, but in practice each bale gets a few pounds of lint from the preceding load, and in turn leaves a like quantity of cotton for the next bale. Thus the bales are not only plated, but, as the loads often are not of the same grade, the better cotton will be penalized down to the value of the lowest grade found, as the grade of a bale is determined by the lower side.

FIG. 17.—Cotton hauled back to the farmyard after ginning and left exposed to weather. Each bale is worth $100 or more and may deteriorate $5 per bale in value by becoming weather-beaten on the outside. This form of neglect is responsible for a great proportion of so-called country damage

GIN FIRES

Many gin fires are caused by matches that have been dropped in the seed cotton and that are ignited when coming in contact with the saws or other parts of the gin; but it has been demonstrated that by far the larger number are caused by sparks of static electricity generated by the operation of the machinery itself, especially on dry days. The presence of static electricity may be discovered easily by bringing a finger close to the lint flue or other parts of the ginning apparatus. A spark will be seen and felt to jump into the finger. If there is no outlet or grounding for this form of electricity it will store up until enough has been accumulated to overcome the resistance and it will then jump with a large, hot spark. Therefore, all parts—elevators, cleaners, feeders, gins, lint flues, etc.—should be thoroughly connected with the ground by suitable wiring (fig. 18). Insurance companies recognize the effectiveness of grounding and give better rates of insurance for gins that are properly grounded.[8]

[8] H. E. Roelke. Grounding cotton gins to prevent fires. U. S. Dept. Agr., Circ. 271, 1923.

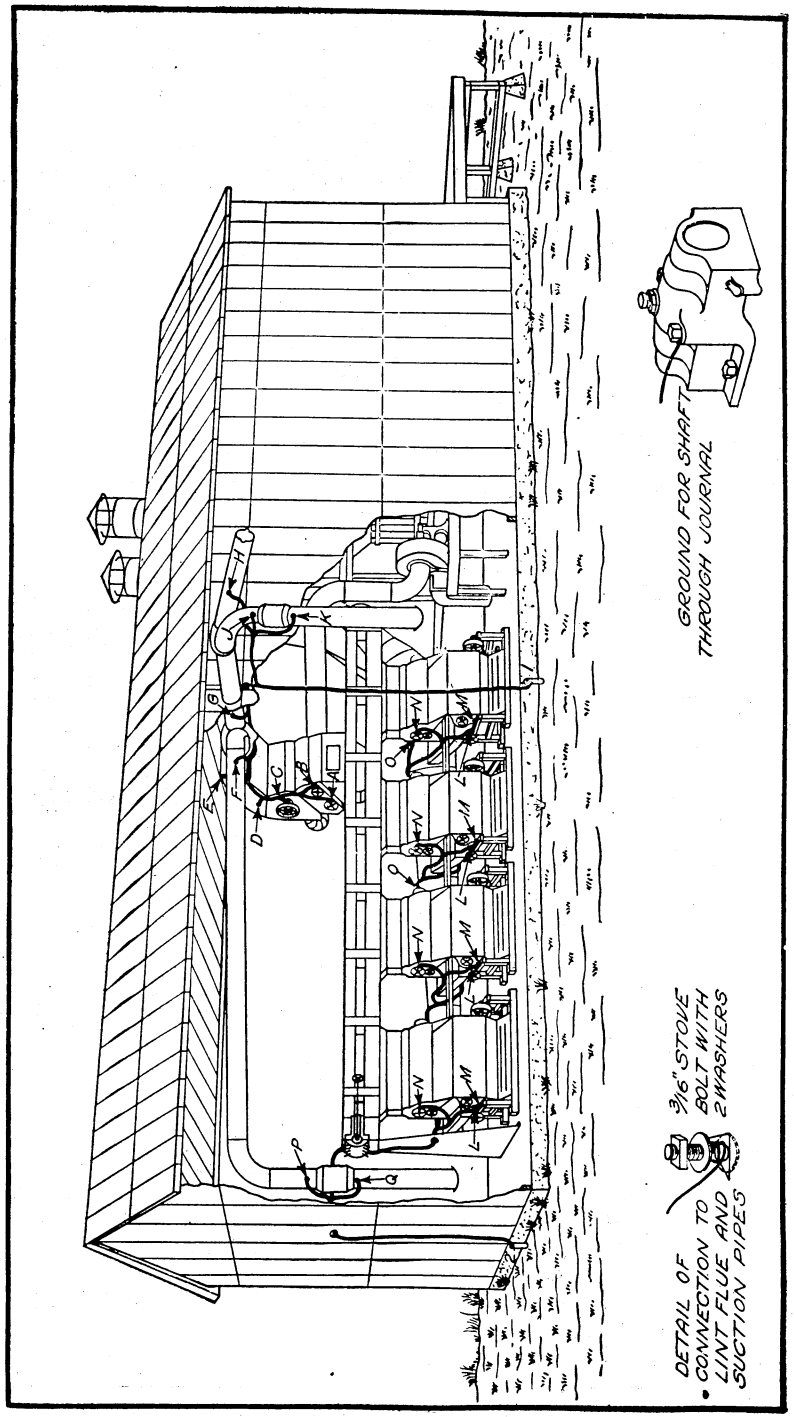


FIG. 18.—Wiring system for grounding cotton gins

FIG. 19.—Cotton yard full of cotton resting on wooden poles. Practically every bale in this yard would be saturated with water following a heavy rain. Often these poles become moldy and rotten, causing decomposition of the cotton and resulting in considerable damage, depending upon the length of time cotton is left in this condition. Cotton "stored" in this way is turned occasionally, thus causing the other side of the bale to deteriorate in the same way. Cotton growers suffer much loss through this method of storing

CARELESS PREPARATION OF THE AMERICAN BALE

After cotton is ginned and baled it is often thrown into the gin yard or cotton yard (fig. 19), or perhaps hauled home and left

FIG. 20.—Railroad platform full of uncompressed cotton ready for loading on freight car, to be shipped to the compress

exposed to the weather (fig. 17). The cotton sometimes becomes weather-beaten 2 or 3 inches deep on each edge. To ascertain the true grade, it is necessary to cut through this plate when the bale is

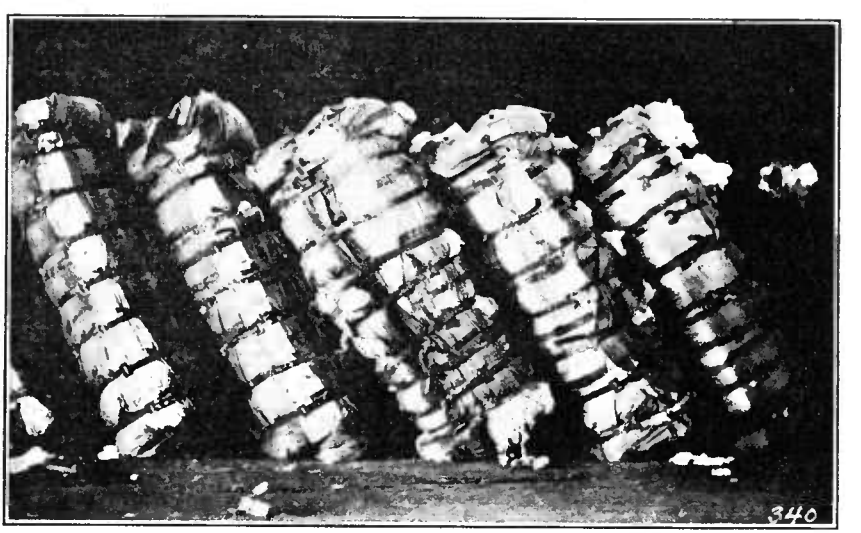


FIG. 21.—Appearance of American bales after being compressed.

sold. The bands have to be loosened and the outside plates taken off, or the price per pound paid for the whole bale will be influenced by

the lower value of the outside plate. In either case an unnecessary loss is sustained. The better protected the cotton has been the easier it is to find a market, and the higher price it should bring. Cotton which

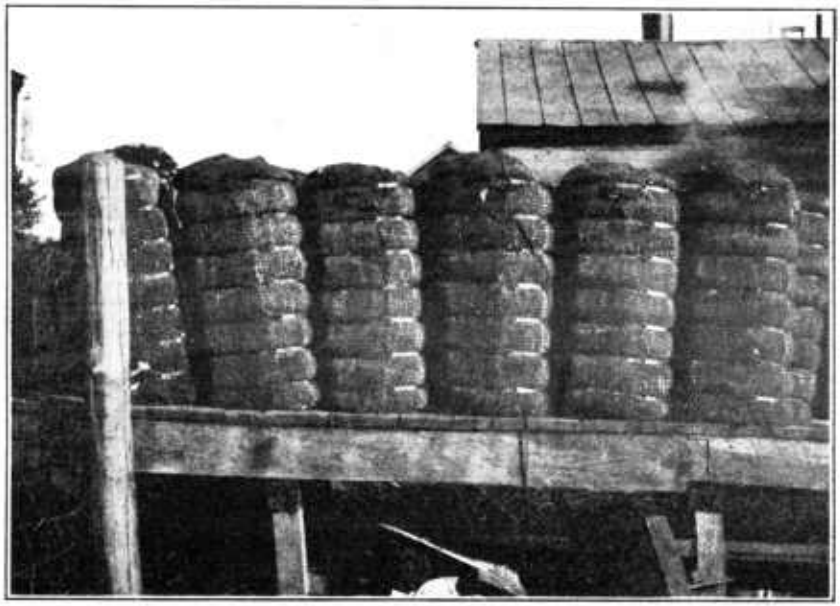


FIG. 22.—Gin-compressed bales on railroad platform ready for direct shipment to domestic mill or port. Note the neat, well-wrapped, and uniform package

has been picked carefully and stored while dry always finds a ready market in normal times, while no one cares to buy weather-beaten or damaged cotton unless it be penalized heavily. It is a well-known

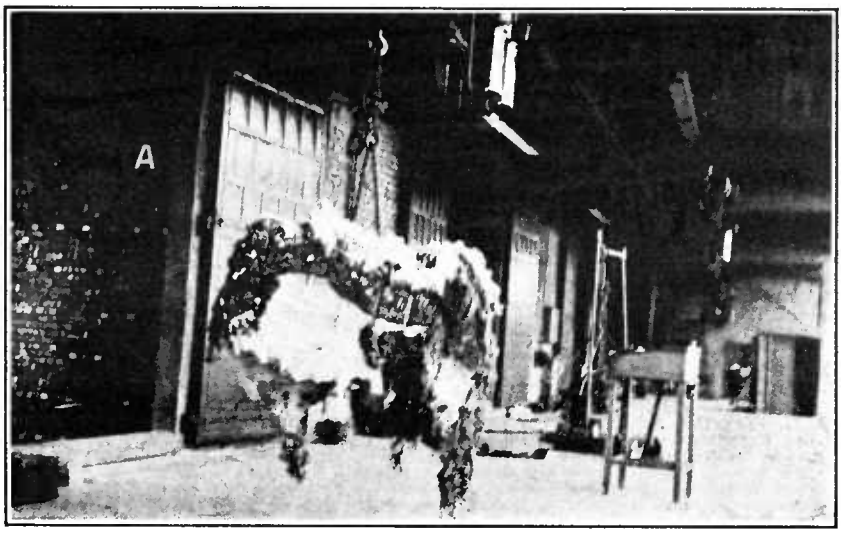


FIG. 23.—Dilapidated appearance of American cotton upon arrival at Manchester, England

fact that buyers must have a larger margin of profit on weather-beaten and damaged cotton on account of the greater risk incurred,

FIG. 24.—Appearance of Indian cotton on arrival at Liverpool, England

as they are not always able to estimate the extent to which it has been damaged and the chances to resell it quickly are not so good, as there is not always a ready market for cotton of this character.

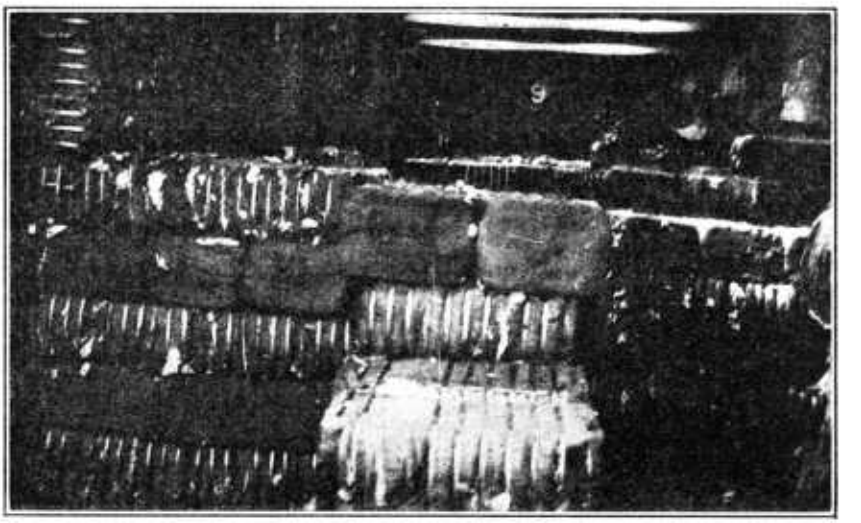


FIG. 25.—Egyptian cotton stored in warehouse at Manchester, England; capacity, 5,300 bales Egyptian cotton, average weight 750 pounds, or a total weight of 3,975,000 pounds. Capacity of these cotton safes, when stored with American cotton, is 3,500 bales, average weight 500 pounds, or a total weight of 1,750,000 pounds. If American cotton were compressed and covered in the same way as Egyptian, many thousands of dollars would be saved to the southern growers each year by reason of lower freight rates, reduced storage charges, and elimination of waste. No photograph of American cotton could be obtained at this place, as American bales are stored only when Egyptian or Indian cotton can not be obtained

No other agricultural product is so neglected as American cotton. Careless wrapping, sampling abuses, indifferent storage, and country damage all combine to illustrate in a most striking manner the utter disregard of consequences and the careless indifference which exists in the handling and marketing of this important and valuable crop. In no other case does a farmer care for his product from the time it is planted in the spring until it is harvested in the fall and then expose it to all kinds of weather and abuse. A comparison of the results of the present methods of handling the American cotton crop with the results obtained in the case of the Egyptian and Indian crops is best shown by Figures 16 to 25, inclusive. It is believed that it is possible to eliminate a part of the loss accruing to the farmer only by bringing to his attention the losses which occur from the time the cotton arrives at the gin until it reaches the mill, a large proportion of the expense of which is borne indirectly by him.

By concerted action the farmers should be able to establish better methods of ginning, maintain pure planting seed, and obtain more uniform and better handling of their cotton, thus enabling them to market their crops to better advantage.

It is to be hoped that the gin manufacturers will develop some device that will insure a quick and accurate method of keeping separate the products from each wagonload of seed cotton.

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